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TITLE: **Sanding or grinding of fibreboard**

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US-CL-CURRENT: 451/227

ABSTRACT:

CHG DATE=19990617 STATUS=O> An arrangement for sanding/grinding the unfinished edges of medium density fibreboards uses an abrasive wheel bonded with polyvinyl alcohol (PVA) impregnated with alumina. The PVA is activated by the heat produced during the sanding process and sticks down the fibres protruding from the edges of the fibreboard. The wheel wears down during use, resulting in a decreasing diameter and peripheral speed. It is necessary to compensate for loss of glue from the wheel to ensure constant contact. To achieve this, a table (6) for supporting the fibreboard can be moved towards the wheel along bars (B) by a motor (11). A frequency inverter (14) controls the speed of the wheel-driving motor (1) to ensure a constant peripheral speed of the wheel. <IMAGE>

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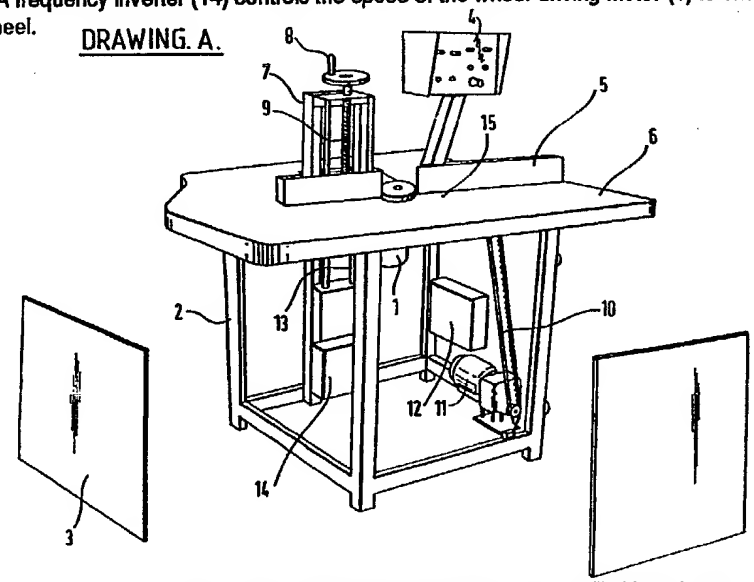
(54) Sanding or grinding of fibreboard

(57) An arrangement for sanding/grinding the unfinished edges of medium density fibreboards uses an abrasive wheel bonded with polyvinyl alcohol (PVA) impregnated with alumina. The PVA is activated by the heat produced during the sanding process and sticks down the fibres protruding from the edges of the fibreboard. The wheel wears down during use, resulting in a decreasing diameter and peripheral speed. It is necessary to compensate for loss of glue from the wheel to ensure constant contact. To achieve this, a table (6) for supporting the fibreboard can be moved towards the wheel along bars (B) by a motor (11). A frequency inverter (14) controls the speed of the wheel-driving motor (1) to ensure a constant peripheral speed of the wheel.

DRAWING. A.



At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1990.

This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1990.

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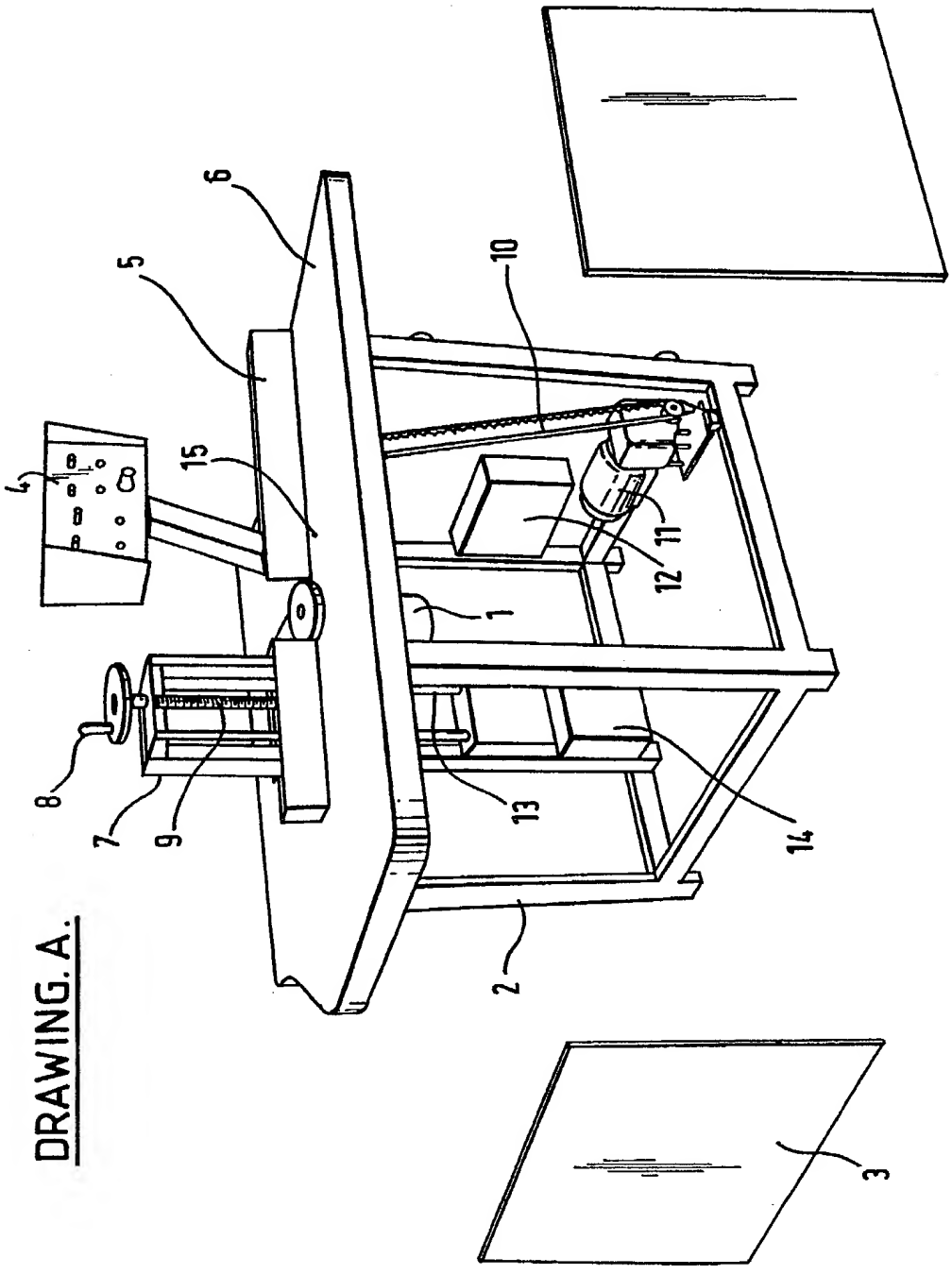
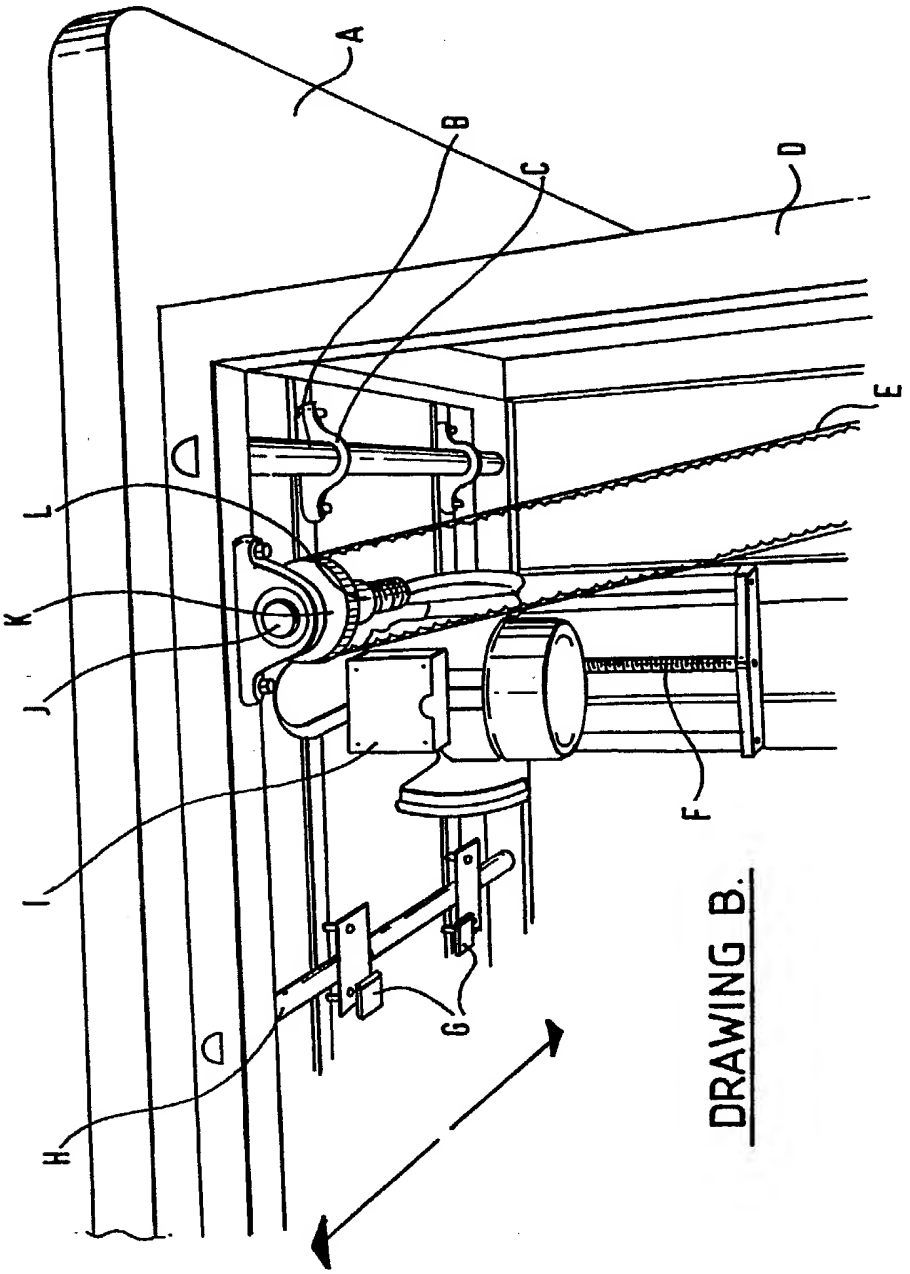
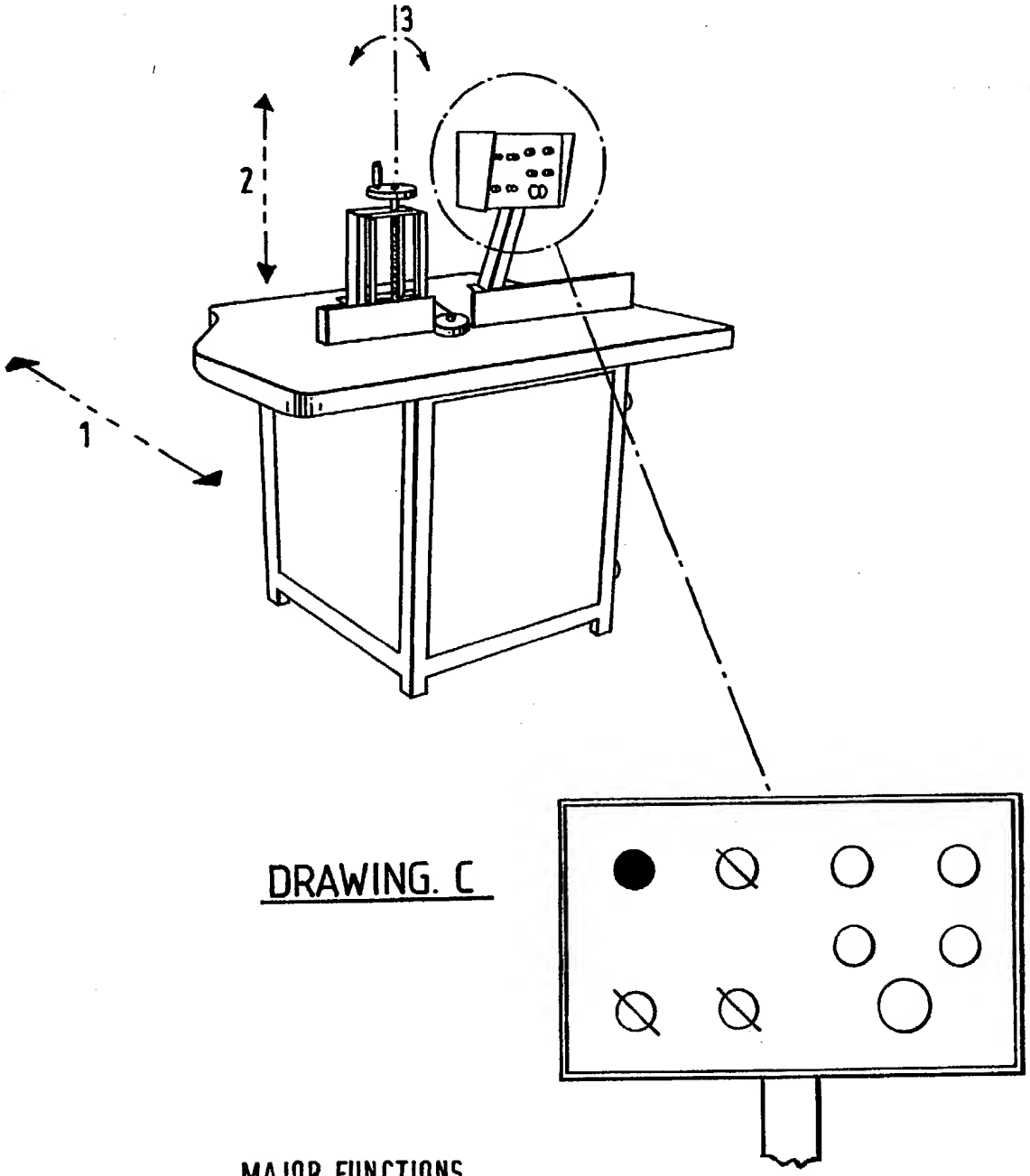


DRAWING. A.



DRAWING B.



DRAWING. C

MAJOR FUNCTIONS

SANDING/GRINDING ARRANGEMENT

Since the advent of MDF (medium density fibreboard) in the furniture industry, there have been many advancements in both the paint technology required for giving a quality finish and also the veneering and staining techniques used by companies wishing to simulate the appearance of solid wood. MDF is an extremely versatile medium and can be cut, shaped and moulded with extreme ease. It accepts laminate and veneers and also painted finishes without any problem, but it has one major problem area and that is that the core of the MDF board is considerably more porous and not so hard as the top and bottom faces. Therefore whenever you cut or mould into the edge of an MDF board, you are immediately revealing new fibres. Thus, when a finish is required, it is the edges which need special attention, not the surface. The surface already being "sealed" by the process of manufacture. However, the edges are far less dense and need to be sanded meticulously prior to a wet finish being applied, i.e. a sealer coat or base coat lacquer. However efficiently and meticulously the edges are sanded, as soon as a base coat lacquer is applied, the fibres within the board will immediately rise up and create a rough finish when touched by the hand. It is also clearly visible by the eye. The process used currently is that once the sealer coat has been applied, the panel is then

returned to be either manually or machine re-sanded or "de-nibbed". This involves putting a heavy coat of sealer on due to the fact that it is having to be re-sanded afterwards and therefore needs to be thick enough to be sanded but still to leave a sealed surface after the sanding operation. This operation is extremely laborious and normally has to be done by hand. The panel will then go in for its second base coat and very often, due to the sanding through which occurs in the first "de-nibbing" process requires a second thorough "de-nibbing" after the second coat; thus entailing a minimum of three sanding operations before the top coat can be applied. When you consider that every MDF sheet used on a piece of furniture normally has four edges and when manufacturers are perhaps producing several hundred, if not thousands of cut and moulded components a day, the problem is quite enormous and is normally solved by employing large numbers of people to hand-sand. This is not only a thoroughly unpleasant job with potential health hazards, but also leads to varying qualities of finish. It has been said on many occasions to the owners of Sand-Tech that anyone who manages to resolve this problem will have found the next best thing to owning the royal mint! Sand-Tech have spent the last eighteen months developing a system for solving this problem and the history of it is as follows:

Sand-Tech discovered that by using an abrasive

wheel similar in appearance to a grinding wheel, but in which the wheel is bonded with a glue which reactivates with heat, rather than a resin as is normally used for such wheels. When the material to be sanded was passed against the wheel, the heat generated by the sanding operation reactivates the glue which has the effect of sticking down the fibres. Sand-Tech have found that a wheel bonded with PVA (poly-vinyl alcohol) impregnated with alumina, has the effect when used for sanding MDF edges of not only sanding and abrading the edges by means of the alumina, but the PVA content was reactivated by the friction caused by the MDF being passed against it and resulted in not only sanding, but also gluing down the fibres in the board. This "sealing process" has more than just one benefit; it now completely eliminates the need for extensive preliminary hand-sanding, but also has the effect of filling any pores that appear in the edge surface. These can often be witnessed in edges that have been hand-sanded and this is caused due to the high build of base coat lacquers that are applied and the fact that they are not sanded back right to the bottom of the pores which are created by the uneven surface of the board due to the fibres protruding through the lacquer. Therefore, the result is that an MDF board, which has been cut or moulded down the edge, can be passed against the PVA sanding wheel which will adopt whichever shape the edge is and

it will both sand and seal the edge so that when the panel receives its first base coat, the surface on the edge of the MDF board is equal if not better than the top surface which has received similar treatment in the ordinary process of its manufacture. This development means that factories employing armies of hand "de-nibbers" can now simply pass the material against the PVA sanding wheel once, and go straight into the spray shop. The savings are obvious. This PVA sanding wheel has been named the ST sanding wheel and will be referred to as the ST wheel from now on. Having now found the solution to this mammoth problem, Sand-Tech were then confronted immediately with a problem, that due to the very soft composite nature of the ST wheel, that when used for sanding lengths of MDF, the diameter reduced fairly quickly, so after passing one or two longish lengths of MDF past the wheel, if fences were being used, the wheel ceased to be effective due to the fact that it had worn down in diameter and therefore the fences had to be adjusted back constantly to ensure that an adequate contact was being made. This immediately brought in a negative aspect that the operators would have to be constantly altering fences and in reality this negated to a large extent the benefit of the ST wheel. Therefore, Sand-Tech set themselves to find a machine which their ST wheel could be fitted to. However, after considerable research, it was found there was no such machine on

the market where the fences would move back automatically as the wheel reduced in diameter and keep a consistent pressure on the edges of the board being sanded. The only solution therefore, was to develop a machine specifically for the ST wheel. This has now been done and the machine named "the MF1".

A DETAILED DESCRIPTION OF THE MACHINE FOLLOWS WITH DRAWINGS ATTACHED

The MF1 edge sanding machine is shown in the attached drawings in which:

Drawing A shows the general constitution and make up of the machine.

Drawing B gives a detailed view of the mechanism for the table movement backwards and forwards.

Drawing C indicates the major moving components and shows a detailed drawing of the control panel. (This may vary in layout from time to time).

Drawing A Detailed Description

The machine is constructed around a welded hollow square section steel frame (Fig. 2) to which a precision made rise and fall bracket is attached (Fig. 7). This holds main motor (Fig. 1). This rise and fall bracket can be wound up and down by turning handle (Fig. 8) which rotates a threaded bar (Fig. 9) connected to the motor mounting plate which is positioned onto the steel frame on cylindrical bars (see explanation of drawing B) which enable it to be moved forwards and backwards. This is done by means

of a geared motor (Fig. 11) which drives a toothed belt (Fig. 10) which rotates a threaded bar, which passes through a phosphor bronze nut (see drawing B). This geared motor is activated by a microswitch situated in the bed (Fig. 15a) which in turn activates an electronic timer (Fig. 12) and after a preset time has elapsed, the geared motor revolves, therefore moving the table forward a preset distance. This movement forward is controlled by another microswitch (Fig. 15b). The work to be sanded is passed against the two fences (Fig. 5) which are set either side of the ST wheel. The control panel (Fig. 4) is situated above the work table so as to be easily accessible. So as to ensure a constant peripheral speed is maintained for the ST wheel, as it reduces in diameter a frequency inverter has been fitted (Fig. 14) and linked to the forward and backward movement of the table. The steel frame has infill panels (Fig. 3) for each face.

Drawing B Detailed Description

This drawing shows the underneath view of the table mechanism for moving it forwards and backwards. (Fig. A) is the table, (Fig. B) are the round bars on which the bearings (Fig. C & G) are attached to which in turn are attached to the table. The mechanism for moving the table backwards and forwards is driven by a geared motor (see drawing A description Fig. 11) which turns the threaded bar (Fig. J) through a

phosphor bronze nut (Fig. L). The threaded bar (Fig. J) is attached to the frame by a bearing and pulley mechanism (Fig. K). Other items in drawing B have already been described in detail in drawing A.

Drawing C Detailed Description

This drawing shows the overall functions of the machine. (1) the forward and backward table movement, (2) the rise and fall mechanism of the motor and (3) the optional facility to have the head tilting.

To look at it the machine resembles a large spindly moulder having a fabricated steel frame base to which the rise and fall mechanism and motor is attached. A surface ground steel table is attached to the frame by two horizontal slide bars with phosphor bronze bearings. The basic principle is that the motor is fitted with an adapter shaft which accepts the ST sanding wheel of varied thicknesses. The motor is attached to a bracket which can be raised and lowered and as an optional extra, can be tilted. Once set up to the correct height, the ST sanding wheel protrudes above the table so that the workpiece can be passed against it. Two fences are attached to the steel table and bolted down in a fixed position, either side of the sanding wheel, therefore controlling exactly how much contact is made between the ST wheel and the MDF board. Then the entire table, being that it is mounted on linear slides, moves forward as the ST wheel reduces in diameter.

This is achieved by a geared motor linked to a timer mechanism, which is activated by a microswitch sticking through the table which is depressed every time a panel is passed through the machine. Therefore, a constant pressure can be achieved due to the fact that once the wheel has worn by a certain amount, the table is inched fractionally forward by the geared motor so as to compensate for the loss in diameter. The other area which needed attention was the peripheral speed of the wheel. This, of course, as the diameter reduces, reduces the speed also. Therefore, a linear inverter, has been fitted so that as the table moves forward via an inverter the motor rotation speed is increased, therefore keeping a constant peripheral speed of the ST wheel. This constant peripheral speed is absolutely essential to the working of the machine as the entire concept relies on the PVA bond reactivating with the heat of the panel being passed through. Obviously as the peripheral speed reduces, the heat generated by the passing MDF board also reduces and therefore the "sealing" effect is not as efficient. Sand-Tech believe that this machine is totally unique in its concept and was developed in the slightly unusual way that the machine was actually built to run a wheel which solved a problem, not a machine developed and then a wheel found to fit onto the machine. Both the ST wheel and the machine can be very basically

described in the following way:

1) The basic principle of trying to remove the problem of loose fibres was solved by sticking the fibres down. The logical time to do this was during another operation i.e. such as sanding, therefore the combining of the sanding and "gluing down" operation was a logical course to pursue.

2) The machine works on two simple principles: i) that constant pressure can be maintained against the wheel i.e. in the moving in of the table to compensate for the reducing diameter. ii) The second principle was to retain a constant peripheral speed adequate to produce an acceptable finish and also to reactivate the PVA within the wheel.

This simple criteria has been fulfilled and the machine will be known as the MF machine. The first machine and ones manufactured in the same way will be known as the MF1 and further developments on the theme will be known as MF2, MF3 etc. etc.

CLAIMS

1. A method of sanding/grinding fibreboard, in which the fibreboard is sanded/ground by an abrasive wheel of an abrasive material bonded by an abrasive which is of glue, the glue being reactivated by the heat generated by the sanding/grinding so as to adhere to the fibreboard, wherein the loss of glue from the wheel due to the adhesion of the glue to the fibreboard is compensated for so as to maintain the wheel in constant pressure contact with the fibreboard.

2. A method according to claim 1, wherein the wheel is driven so as to maintain a constant peripheral speed despite the loss of glue from the wheel.

3. A method according to claim 1 or claim 2, where the glue is of polyvinyl alcohol.

4. A method of sanding/grinding a fibreboard substantially as herein described with reference to the accompanying drawings.

5. An apparatus for sanding/grinding the fibreboard, comprising;

a table for supporting the fibreboard;

an abrasive wheel for sanding/grinding the fibreboard, the wheel being of an abrasive material bonded by glue, which glue is adapted to be reactivated by heat generated by sanding/grinding of the fibreboard; and

compensating means for compensating for the loss

of glue from the wheel due to the reactivation, the compensating means being arranged to maintain the wheel in constant pressure contact with the fibreboard.

6. An apparatus according to claim 5, having drive means for the wheel adapted to maintain a constant peripheral speed despite the loss of glue from the wheel.

7. An apparatus according to claim 5 or claim 6, wherein the glue is of polyvinyl alcohol.

8. An apparatus for sanding/grinding fibreboard substantially as herein described with reference to and as illustrated in the accompanying drawings.

Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search Report)

Application number
GB 9120888.4

Relevant Technical fields

(i) UK Cl (Edition K) B3D (DFD, DHW, DMX)

(ii) Int Cl (Edition 5) B24B

Search Examiner
T W RICHENS

Databases (see over)

(i) UK Patent Office

(ii) ONLINE DATABASE: WPI

Date of Search
15 DECEMBER 1992

Documents considered relevant following a search in respect of claims 1-8

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
A	GB 0913226 (MIDWEST) Claim 1	1,5

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

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